

VACET Visualization and Analysis at ORNL (2007 update)

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ORNL VACET Team

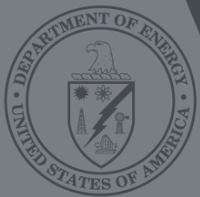


Sean Ahern
Dave Pugmire (new)
George Ostrouchov
Jeremy Meredith
Jamison Daniel
Markus Glatter (UTK student)



ORNL VACET Compute Resources

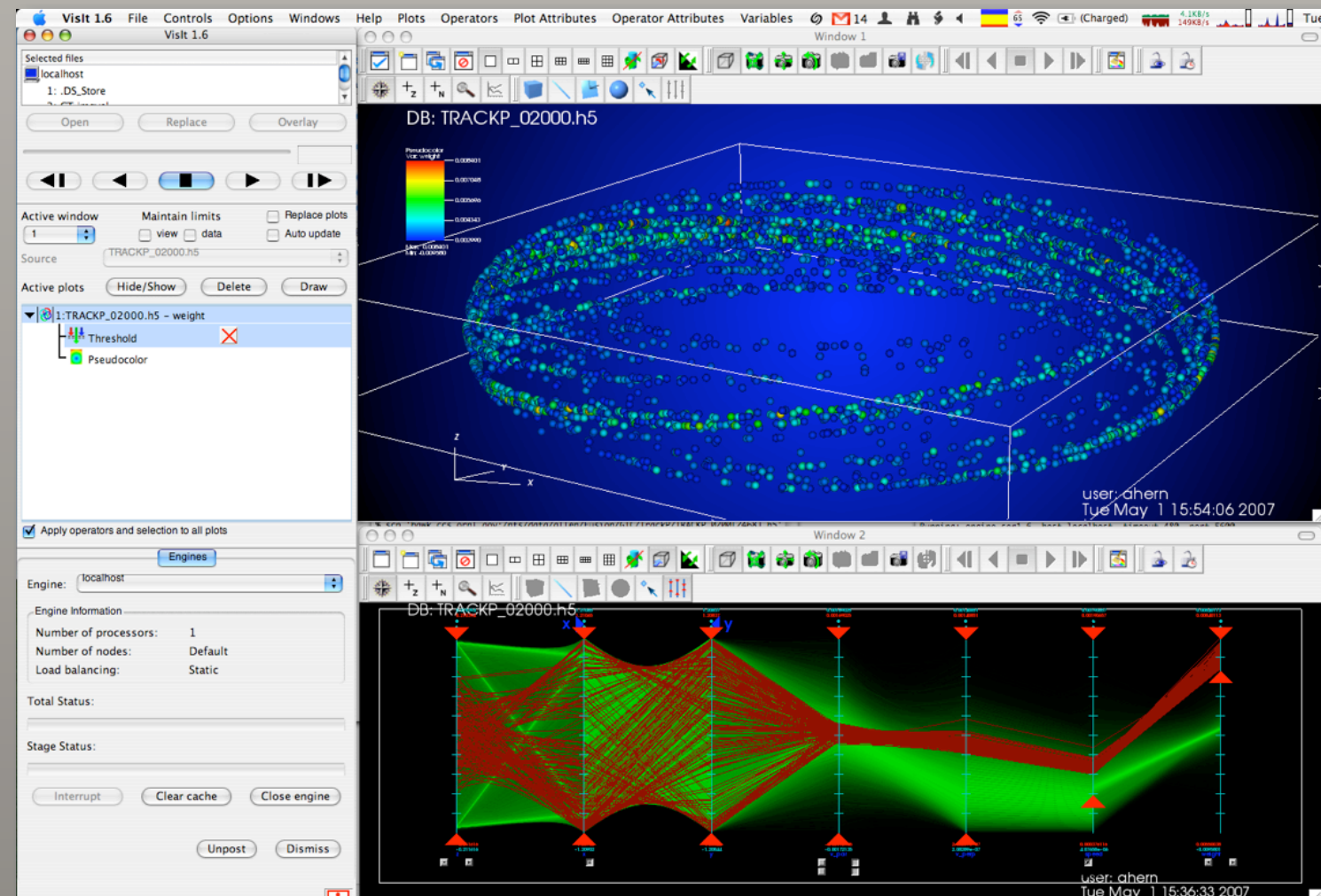
- 2007: 100,000 hours on Cray XT3/4 (Jaguar):
 - #2 on Top500 list at 119 TF
 - 23,016 Opteron cores
 - Many SciDAC customers
 - *Ideal for in-situ analysis work*
- Existing vis system (Hawk):
 - 44 node vis cluster, 88 processors, 88 GB RAM
- About to site new vis/analysis cluster (Lens):
 - 32 nodes, 512 Opteron cores, 2 TB of RAM, 64 GPUs
 - Connected to large Lustre store (~1.6 PB)



Some notable projects in the last year

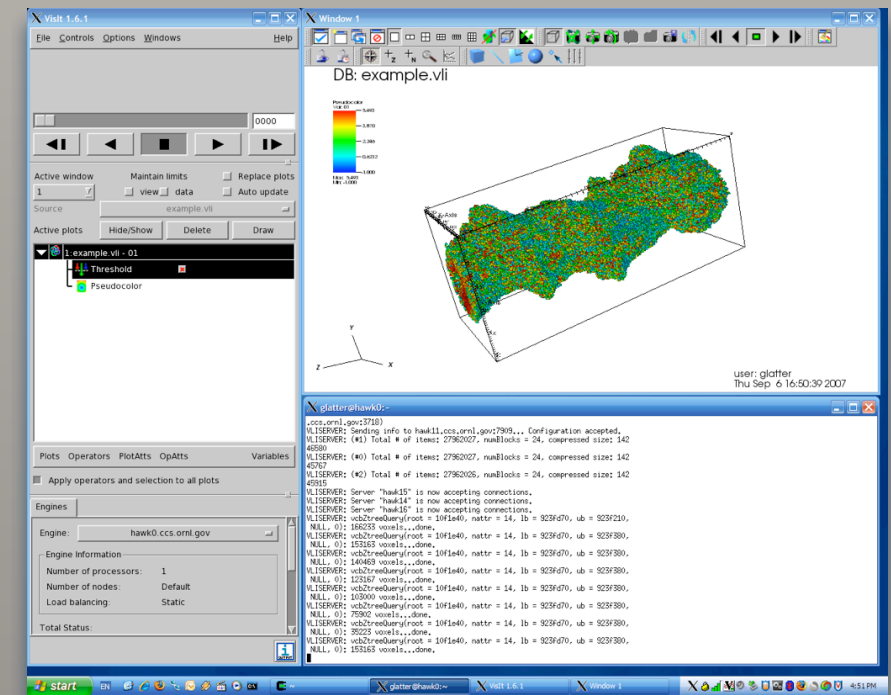
High dimensional filtering

- Information visualization technique (a.k.a. parallel coordinates)
- Consists of three linked capabilities
 - Parallel coordinates plot with summary view for large data
 - Restriction tool
 - Multivariate threshold operator
- Implemented in VisIt
- Used to filter multivariate data from particle-in-cell fusion code
- Demonstrated in parallel on ~60 million zone combustion data



Efficient Boolean Range Queries

- Harnessed VisIt's "contracts" system to optimize multivariate data thresholding
- Connected to IUSV technology for scalable data servers
 - "Scalable Data Servers for Large Multivariate Volume Visualization", Markus Glatter, Colin Mollenhour, Jian Huang and Jinzhu Gao, IEEE Transactions on Visualization and Computer Graphics, Vol. 12, No. 5, pp. 1291-1299, 2006.
- Puts groundwork in place for connecting to other query systems (FastBit)
- *Will be demoed at Supercomputing in 2 weeks*

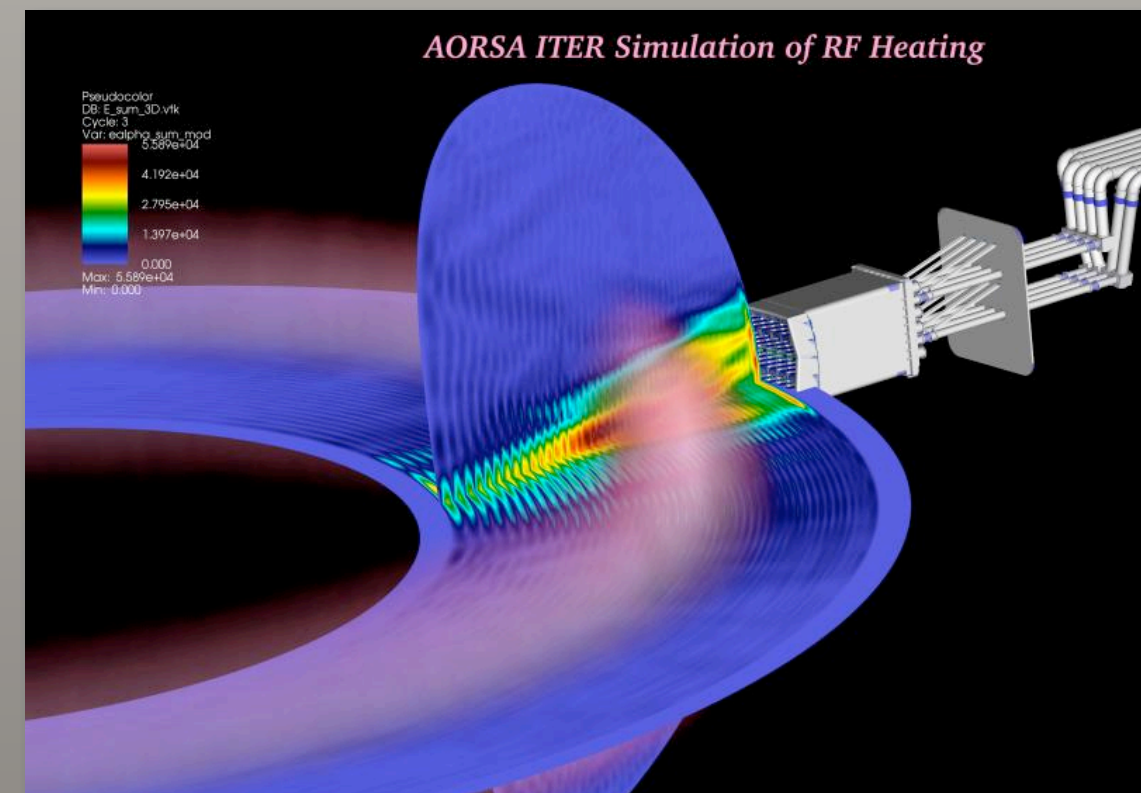


Representative Particle Field Sampling

- Statistical methods to reduce I/O for extremely large datasets
- Preserves nature of data, including trends and extrema
- R infrastructure:
 - Uncertainty quantification
 - Cluster algorithms
 - Extreme value theory
 - Data parallel implementation (R-MPI)

VisIt work (lower level)

- Assisted in move from LLNL to NERSC code repository
 - Have successfully transitioned entirely from ClearCase at LLNL to Subversion at NERSC
- Database options
 - Provides ability to create GUIs on the fly for custom data loading and parameterized I/O
 - More work needed here
- Automatic SSH tunneling
 - Needed for remote deployment in firewalled environments
- Debugging APDEC/Chombo data from within gdb using VisIt



Upcoming work

- Deployment of all major VACET tools on new systems (VisIt, ViSUS, Manta, SCIRun)
- New fusion support in VisIt
 - Streamline improvements
 - Poincaré analysis
 - Temporal analysis
- Deployment of CDAT/ViSUS workflow for Drake (climate)
- In-situ analysis for Chen (combustion) in VisIt
- Move entire VisIt development process to GForge (wiki, testing, mailing lists, bug tracking, ...)

